ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

INSULATING GLASS UNITS: DOUBLE AND TRIPLE GLASS CONFIGURATIONS

KLAASIMEISTER AS

GENERAL INFORMATION

MANUFACTURER INFORMATION

Manufacturer	Klaasimeister AS
Address	Harjumaa, Kose vald, Kolu, 75121, Estonia
Contact details	info@klaasimeister.ee
Website	www.klaasimeister.ee

PRODUCT IDENTIFICATION

Product name	Insulating glass units: double and triple glass configurations.
Place(s) of production	Estonia

The Building Information Foundation RTS sr

EPDs within the same product category but from different programmes may not be comparable.

Jukka Seppänen
RTS EPD Committee Secretary

Laura Apilo
Managing Director

EPD INFORMATION

The EPD owner has the sole ownership, liability, and responsibility for the EPD. Construction products EPDs may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

EPD program operator	The Building Information Foundation RTS sr
EPD standards	This EPD is in accordance with EN 15804+A2 and ISO 14025 standards.
Product category rules	The CEN standard EN 15804 serves as the core PCR. In addition, the RTS PCR (English version, 26.8.2020) and EN 17074:2019 is used.
EPD author	Mari Kirss Rangi Maja OÜ www.lcasupport.com
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
Verification date	3 October 2022
EPD verifier	Sigita Židonienė Vesta Consulting UAB www.vestaconsulting.lt
EPD number	RTS_194_22
Publishing date	October 27, 2022
EPD valid until	October 27, 2027

PRODUCT INFORMATION

PRODUCT DESCRIPTION

Assembly consisting of double or triple panes of glass, separated by one or more spacers. Hermetically sealed along the periphery. Mechanically stable and durable.

The two products presented on the EPD are averaged products that represent several variations that include laminated and/or tempered glass in addition to regular flat glass.

The glass panes come in different thicknesses. The results are calculated per declared unit but can be converted for desired thicknesses with the help of conversion formulas or conversion factors (included in the annexes).

PRODUCT APPLICATION

Used for installation as bonded glazing for doors, windows and curtain walling with possible permanent shear load on edge sealant with or without direct UV radiation exposure.

PHYSICAL PROPERTIES OF THE PRODUCT

Min size: 190 mm x 350 mm; Max size 3210 mm x 6000 mm; Thickness 12-100 mm; Max weight 1500 kg

ADDITIONAL TECHNICAL INFORMATION

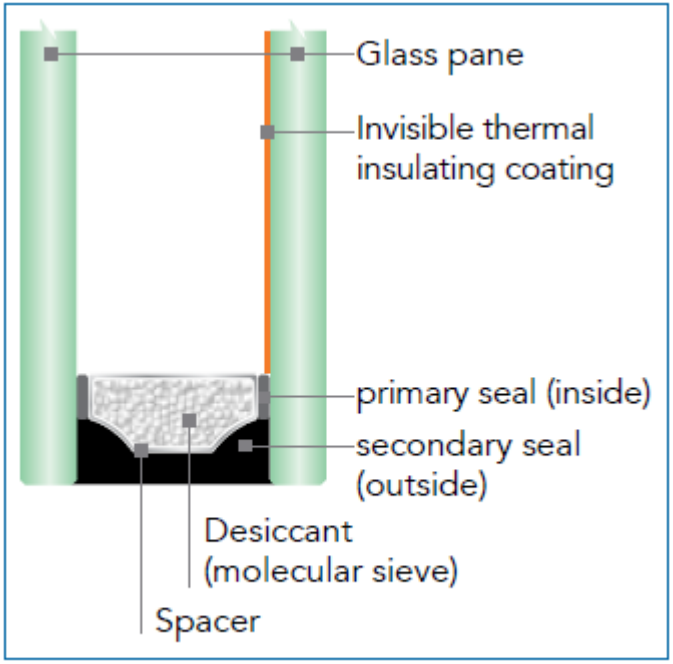
Further information can be found at www.klaasimeister.ee.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	<0.1	Global
Minerals	95	Europe
Fossil materials	5	Global
Bio-based materials	0	N/A

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).



Insulating glass structure

PRODUCT LIFE-CYCLE

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

The final product is transported 1000 km by an average lorry and 220 km by ferry. This is a weighted average of all options.

This EPD does not cover the installation phase.

PRODUCT USE AND MAINTENANCE (B1-B7)

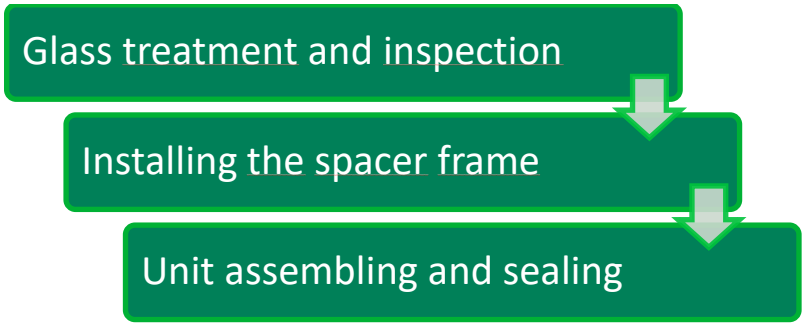
This EPD does not cover the use phase.
Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

At the end-of-life, in the demolition phase, 50% of the glass is assumed to be collected as separate glass waste and 50% as mixed construction waste with other components (C1). Around 50% end-of-life product is assumed to be sent to the closest facilities (C2) and around 50% is landfilled (C4).

MANUFACTURING PROCESS

The manufacturing process starts with washing the glass panes. After the panes have been washed and inspected, the mounting spacer frame is installed and the unit is assembled at the gas press. Finally, the unit is sealed at the sealing robot.



ABOUT THE MANUFACTURER

Klaasimeister always aims to provide the highest quality standards in the industry. Our production conforms to all the European standards for glass processing: EN12543 laminated glass; EN12150 tempered glass and edge treatment; EN572 float glass; EN1279 insulated glass units; EN1863 heat strengthening; EN14179-1 heat soak testing. Our Quality Management System has been certified to be in accordance with the ISO:9001 quality management and the ISO:14001 environmental management standards.

LIFE-CYCLE ASSESSMENT

LIFE-CYCLE ASSESSMENT INFORMATION

Period for data	2021

DECLARED UNIT

Declared unit	1 m2
Mass per declared unit	42.5 kg (Double pane) 53.5 kg (Triple pane)
Total glass thickness	16.22 mm (Double pane) 20.32 mm (Triple pane)

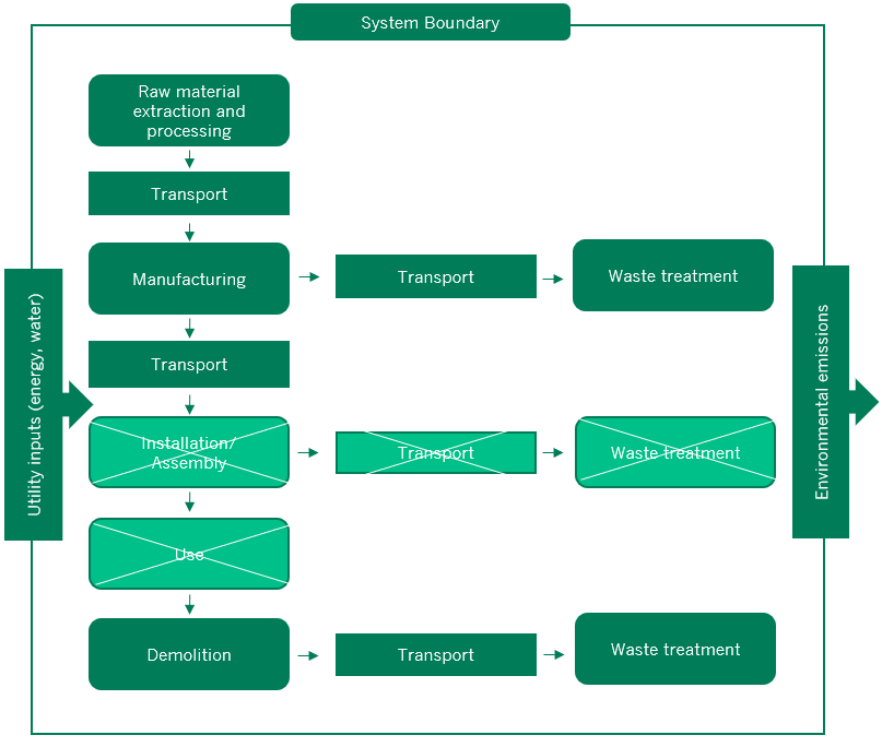
BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0.0
Biogenic carbon content in packaging, kg C	0.39
Note. 1 kg biogenic carbon is equivalent to 44/12 kg of biogenic CO2.	

SYSTEM BOUNDARY

This EPD covers the cradle to gate with options scope with the following modules; A1 (Raw material supply), A2 (Transport) and A3 (Manufacturing), A4 (Transport) as well as C1 (Deconstruction), C2 (Transport at end-of-life), C3 (Waste processing) and C4 (Disposal). In addition, module D - benefits and loads beyond the system boundary is included.



Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
x	x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x	x	x
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demol.	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND. Modules not relevant = MNR.

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019 and the applied PCR. The study does not exclude any hazardous materials or substances.

The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

Cut-off has been applied only in EOL to exclude fasteners or any other materials attached to the Products during installation.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation.

In this study, as per EN 15804, allocation is conducted in the following order;

1. Allocation should be avoided.
2. Allocation should be based on physical properties (e.g. mass, volume) when the difference in revenue is small.
3. Allocation should be based on economic values.

This LCA study is conducted in accordance with all methodological considerations, such as performance, system boundaries, data quality, allocation procedures, and decision rules to evaluate inputs and outputs. All estimations and assumptions are given below:

• Module A2, A4 & C2

Vehicle capacity utilization volume factor is assumed to be 1 which means full load. In reality, it may vary but as role of transportation emission in total results is small and so the variety in load is assumed to be negligible. Empty returns are not taken into account as it is assumed that return trip is used by transportation company to serve the needs of other clients.

• Module A3

Waste and energy have been allocated based on production volume.

• Module A4

The transportation distance is defined according to RTS PCR. The typical installation place was assumed as a weighted average of all options – 1000 km by lorry and 220 km by ferry. According to the manufacturer, transportation doesn't cause losses as products are

packaged properly. Also, volume capacity utilisation factor is assumed to be 1 for the nested packaged products.

• Module C1

Demolition is assumed to take 0.01 kWh/kg (Bozdağ, Ö & Seçer, M (2007) and the Level(s) project). It is assumed that 100% of the waste is collected.

• Module C2

It is estimated that there is no mass loss during the use of the product, therefore the end-of-life product is assumed to have the same weight with the declared product. All of the end-of-life product is assumed to be sent to the closest facilities such as recycling and landfill. Transportation distance to the closest disposal area is estimated as 200 km and the transportation method is assumed as lorry which is the most common option.

• Module C3

50% of the glass is recycled. Losses in the sorting process are assumed to be very small and not considered in the assessment.

• Module C4

The remaining 50% of the glass and 100% of other materials are assumed to be sent to landfill.

• Module D

Benefits of recyclable waste generated in the Module C3 are considered. It is assumed that 40% of the recycled waste flat glass is used to produce glass wool and 60% is used as aggregates (for example, in road base).

Allocation used in Ecoinvent 3.6 environmental data sources follows the methodology 'allocation, cut-off by classification'. This methodology is in line with the requirements of the EN 15804 - standard.

SOFTWARE AND DATABASE

The LCA and EPD have been created using One Click LCA Pre-Verified EPD Generator for Construction products.

This EPD is based on the Ecoinvent 3.6 (cut-off) database and specific EPDs.

BIBLIOGRAPHY

ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations. Principles and procedures.

ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.

ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.

ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services

EN 17074:2019 Glass in building - Environmental product declaration - Product category rules for flat glass products

EN 15804:2012+A2:2019 Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products.

RTS PCR (English version, 26.8.2020)

Ecoinvent database v3.6 (2019) and One Click LCA database

Waste Framework Directive 2008/98/EC

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Mathieu Hestin, Sarah de Veron & Stephanie Burgos. (2016). Economic study on recycling of building glass in Europe. [http://www.glassforeurope.com/wp-content/uploads/2018/04/Economic-study-on-recycling-of-building-glass-in-Europe-Deloitte.pdf]

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SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality	Modelled electricity based on Estonian residual mix for 2020-2021
Electricity CO_2e / kWh	0.60
District heating data source and quality	N/A
District heating CO_2e / kWh	N/A

Transport scenario documentation (A4)

Scenario parameter	Value
Specific transport CO_2e emissions, kg CO_2e / tkm	0.020 (GWP-fossil)
Average transport distance, km	1000 km by lorry, 220 km by ferry
Capacity utilization (including empty return) %	100
Mass of transported products	48.4 kg (Double pane) 59.4 kg (Triple pane)
Volume capacity utilization factor	=1

End of life scenario documentation

Scenario parameter	Value
Collection process – kg collected separately	20.23 kg (Double pane) 25.34 kg (Triple pane)
Collection process – kg collected with mixed waste	22.24 kg (Double pane) 28.16 kg (Triple pane)
Recovery process – kg for re-use	0 kg
Recovery process – kg for recycling	20.23 kg (Double pane) 25.34 kg (Triple pane)
Recovery process – kg for energy recovery	0 kg
Disposal (total) – kg for final deposition	22.24 kg (Double pane) 28.16 kg (Triple pane)
Scenario assumptions e.g. transportation	End-of-life product is transported 200 km with an average lorry.

ENVIRONMENTAL IMPACT DATA

Note: additional environmental impact data may be presented in annexes.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

		Double glass							Triple glass						
Impact category	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
GWP – total	kg CO_2e	8.05E1	6.09E0	1.4E-1	1.42E0	9.6E-2	1.88E-1	-8.36E0	9.16E1	6.68E0	1.76E-1	1.79E0	1.26E-1	2.38E-1	-1.05E1
GWP – fossil	kg CO_2e	7.95E1	6.14E0	1.4E-1	1.42E0	9.47E-2	1.87E-1	-8.75E0	9.06E1	6.73E0	1.76E-1	1.78E0	1.25E-1	2.37E-1	-1.1E1
GWP – biogenic	kg CO_2e	9.22E-1	3.23E-3	3.89E-5	7.55E-4	1.24E-3	2.8E-4	4.01E-1	9.71E-1	3.54E-3	4.91E-5	9.52E-4	1.63E-3	3.54E-4	5.02E-1
GWP – LULUC	kg CO_2e	4.02E-2	2.25E-3	1.18E-5	5.02E-4	1.01E-4	7.49E-5	-4.84E-3	4.27E-2	2.47E-3	1.49E-5	6.32E-4	1.33E-4	9.49E-5	-6.07E-3
Ozone depletion pot.	kg $CFC_{-11}e$	1.05E-5	1.4E-6	3.02E-8	3.22E-7	1.96E-8	6.27E-8	-8.86E-7	1.27E-5	1.53E-6	3.81E-8	4.05E-7	2.58E-8	7.93E-8	-1.11E-6
Acidification potential	mol H^+e	6.22E-1	6.27E-2	1.46E-3	5.78E-3	6.76E-4	1.56E-3	-7.26E-2	7.2E-1	6.87E-2	1.84E-3	7.28E-3	8.89E-4	1.97E-3	-9.1E-2
EP-freshwater[3)]	kg Pe	2.16E-3	4.49E-5	5.66E-7	1.18E-5	4.33E-6	2.41E-6	-2.31E-4	2.32E-3	4.92E-5	7.13E-7	1.49E-5	5.7E-6	3.05E-6	-2.89E-4
EP-marine	kg Ne	1E-1	1.67E-2	6.47E-4	1.72E-3	1.98E-4	5.44E-4	-1.04E-2	1.18E-1	1.83E-2	8.15E-4	2.17E-3	2.6E-4	6.89E-4	-1.31E-2
EP-terrestrial	mol Ne	1.19E0	1.85E-1	7.09E-3	1.9E-2	2.21E-3	5.99E-3	-1.29E-1	1.4E0	2.03E-1	8.94E-3	2.39E-2	2.9E-3	7.58E-3	-1.61E-1
POCP ("smog")	kg NMVOCe	3.01E-1	5.2E-2	1.95E-3	5.81E-3	6.23E-4	1.72E-3	-3.19E-2	3.53E-1	5.7E-2	2.46E-3	7.32E-3	8.19E-4	2.18E-3	-4E-2
ADP-minerals & metals	kg Sbe	1.31E-3	9.14E-5	2.14E-7	3.83E-5	1.16E-6	2.63E-6	-4.92E-4	1.67E-3	1E-4	2.69E-7	4.82E-5	1.53E-6	3.33E-6	-6.16E-4
ADP-fossil resources	MJ	1.17E3	9.19E1	1.93E0	2.13E1	1.89E0	4.3E0	-1.02E2	1.83E3	1.01E2	2.43E0	2.69E1	2.48E0	5.45E0	-1.28E2
Water use[2)]	m^3e depr.	2E1	3.12E-1	3.59E-3	6.87E-2	4.72E-2	1.57E-1	-2.45E0	2.45E1	3.42E-1	4.53E-3	8.66E-2	6.2E-2	1.99E-1	-3.07E0

1) GWP = Global Warming Potential; EP = Eutrophication potential; POCP = Photochemical ozone formation; ADP = Abiotic depletion potential. 2) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

USE OF NATURAL RESOURCES

		Double glass							Triple glass						
Impact category	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Renew. PER as energy	MJ	5.42E1	1.05E0	1.04E-2	3.01E-1	1.43E-1	4.59E-2	-1.29E1	8.12E1	1.15E0	1.31E-2	3.8E-1	1.88E-1	5.82E-2	-1.61E1
Renew. PER as material	MJ	2.35E1	0E0	0E0	0E0	0E0	0E0	0E0	2.37E1	0E0	0E0	0E0	0E0	0E0	0E0
Total use of renew. PER	MJ	7.76E1	1.05E0	1.04E-2	3.01E-1	1.43E-1	4.59E-2	-1.29E1	1.05E2	1.15E0	1.31E-2	3.8E-1	1.88E-1	5.82E-2	-1.61E1
Non-re. PER as energy	MJ	1.14E3	9.19E1	1.93E0	2.13E1	1.89E0	4.3E0	-1.02E2	1.83E3	1.01E2	2.43E0	2.69E1	2.48E0	5.45E0	-1.28E2
Non-re. PER as material	MJ	2.74E1	0E0	0E0	0E0	0E0	0E0	0E0	3.43E1	0E0	0E0	0E0	0E0	0E0	0E0
Total use of non-re. PER	MJ	1.17E3	9.19E1	1.93E0	2.13E1	1.89E0	4.3E0	-1.02E2	1.86E3	1.01E2	2.43E0	2.69E1	2.48E0	5.45E0	-1.28E2
Secondary materials	kg	1.97E0	0E0	0E0	0E0	0E0	0E0	-2.76E-2	5.55E0	0E0	0E0	0E0	0E0	0E0	-3.46E-2
Renew. secondary fuels	MJ	6.33E-21	0E0	0E0	0E0	0E0	0E0	0E0	7.92E-20	0E0	0E0	0E0	0E0	0E0	0E0
Non-ren. secondary fuels	MJ	7.43E-20	0E0	0E0	0E0	0E0	0E0	0E0	9.3E-19	0E0	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m^3	4.95E-1	1.72E-2	1.7E-4	3.65E-3	1.22E-3	3.8E-3	-8.59E-2	6.59E-1	1.89E-2	2.14E-4	4.6E-3	1.6E-3	4.82E-3	-1.08E-1

PER = Primary energy resources

END OF LIFE – WASTE

		Double glass							Triple glass						
Impact category	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste	kg	2.25E0	9.12E-2	2.07E-3	2.17E-2	0E0	4.98E-3	-2.78E-1	2.45E0	1E-1	2.61E-3	2.73E-2	0E0	6.31E-3	-3.48E-1
Non-hazardous waste	kg	1.01E2	8.33E0	2.22E-2	1.49E0	0E0	2.22E1	-7.95E0	1.1E2	9.14E0	2.79E-2	1.87E0	0E0	2.82E1	-9.96E0
Radioactive waste	kg	6.46E-3	6.34E-4	1.35E-5	1.46E-4	0E0	2.82E-5	-3.33E-4	1.88E-2	6.95E-4	1.7E-5	1.84E-4	0E0	3.57E-5	-4.17E-4

END OF LIFE – OUTPUT FLOWS

		Double glass							Triple glass						
Impact category	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	1.01E1	0E0	0E0	0E0	1.93E1	0E0	0E0	1.34E1	0E0	0E0	0E0	2.53E1	0E0	0E0
Materials for energy rec	kg	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Exported energy	MJ	4.61E-2	0E0	0E0	0E0	0E0	0E0	0E0	5.77E-2	0E0	0E0	0E0	0E0	0E0	0E0

KEY INFORMATION TABLE (RTS) – KEY INFORMATION PER KG OF PRODUCT

		Double glass							Triple glass						
Impact category	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
GWP – total	kg CO_2e	1.89E0	1.45E-1	3.3E-3	3.33E-2	2.26E-3	4.42E-3	-1.97E-1	1.71E0	1.26E-1	3.3E-3	3.34E-2	2.36E-3	4.44E-3	-1.96E-1
ADP-minerals & metals	kg Sbe	3.27E-5	2.15E-6	5.03E-9	9.01E-7	2.73E-8	6.2E-8	-1.16E-5	3.34E-5	1.87E-6	5.03E-9	9.02E-7	2.85E-8	6.23E-8	-1.15E-5
ADP-fossil	MJ	2.7E1	2.16E0	4.53E-2	5.02E-1	4.44E-2	1.01E-1	-2.41E0	3.5E1	1.88E0	4.54E-2	5.03E-1	4.64E-2	1.02E-1	-2.39E0
Water use	m^3e depr.	4.71E-1	7.34E-3	8.46E-5	1.62E-3	1.11E-3	3.69E-3	-5.77E-2	4.57E-1	6.4E-3	8.46E-5	1.62E-3	1.16E-3	3.71E-3	-5.74E-2
Secondary materials	kg	4.64E-2	0E0	0E0	0E0	0E0	0E0	-6.5E-4	1.04E-1	0E0	0E0	0E0	0E0	0E0	-6.47E-4
Biog. C in product	kg C	0E0	N/A	N/A	N/A	N/A	N/A	N/A	0E0	N/A	N/A	N/A	N/A	N/A	N/A
Biog. C in packaging	kg C	9.18E-3	N/A	N/A	N/A	N/A	N/A	N/A	9.18E-3	N/A	N/A	N/A	N/A	N/A	N/A

VERIFICATION STATEMENT

VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with EN 15804, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The background report (project report) for this EPD

Why does verification transparency matter? Read more online.

VERIFICATION OVERVIEW

Following independent third party has verified this specific EPD:

EPD verification information	Answer
Independent EPD verifier	Sigita Židonienė
EPD verification started on	23 September 2022
EPD verification completed on	3 October 2022
Approver of the EPD verifier	The Building Information Foundation RTS sr

Author & tool verification	Answer
EPD author	Mari Kirss
EPD Generator module	Construction products
Software verification date	17 January 2021

THIRD-PARTY VERIFICATION STATEMENT

I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of

- the data collected and used in the LCA calculations,
- the way the LCA-based calculations have been carried out,
- the presentation of environmental data in the EPD, and
- other additional environmental information, as present

with respect to the procedural and methodological requirements in ISO 14025:2010 and EN 15804:2012+A2:2019.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

Sigita Židonienė

ANNEX 1 : ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

		Double glass							Triple glass						
Impact category	**Unit**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**	**A1-A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Global Warming Pot.	kg CO_2e	7.35E1	6.09E0	1.39E-1	1.4E0	9.32E-2	1.84E-1	-8.59E0	1.24E2	6.68E0	1.75E-1	1.77E0	1.23E-1	2.34E-1	-1.08E1
Ozone depletion Pot.	kg CFC_{-11}e	1E-5	1.11E-6	2.39E-8	2.56E-7	1.67E-8	4.97E-8	-7.3E-7	1.21E-5	1.22E-6	3.01E-8	3.22E-7	2.19E-8	6.3E-8	-9.14E-7
Acidification	kg SO_2e	2.8E-1	4.36E-2	2.07E-4	2.84E-3	2.63E-3	7.75E-4	-6.04E-2	4.72E-1	4.78E-2	2.6E-4	3.58E-3	3.46E-3	9.81E-4	-7.57E-2
Eutrophication	kg PO_4^3e	7.78E-2	5.79E-3	3.64E-5	5.83E-4	1.74E-4	1.71E-4	-9.4E-3	1.09E-1	6.35E-3	4.59E-5	7.35E-4	2.29E-4	2.16E-4	-1.18E-2
POCP (“smog”)	kg C_2H_4e	1.22E-2	1.49E-3	2.13E-5	1.87E-4	1.98E-5	4.49E-5	-2.23E-3	2.44E-2	1.64E-3	2.68E-5	2.35E-4	2.6E-5	5.69E-5	-2.8E-3
ADP-elements	kg Sbe	1.31E-3	9.14E-5	2.14E-7	3.83E-5	1.16E-6	2.63E-6	-4.92E-4	1.67E-3	1E-4	2.69E-7	4.82E-5	1.53E-6	3.33E-6	-6.16E-4
ADP-fossil	MJ	1.17E3	9.19E1	1.93E0	2.13E1	1.89E0	4.3E0	-1.02E2	1.83E3	1.01E2	2.43E0	2.69E1	2.48E0	5.45E0	-1.28E2

ANNEX 2 : CONVERSION FORMULAS AND FACTORS

The results are calculated for a set thickness for both products. The results for other thicknesses can be calculated with the help of following conversion formulas, where x denotes the total thickness of the glass layers.

Double glass	0.0587x+0.0472
Triple glass	0.0466x+0.0527

The following table includes some example conversion factors.

Total glass thickness	Double glass	Triple glass
12	0.75	0.61
16	0.99	0.80
20	1.22	0.99
24	1.46	1.17
30	1.81	1.45